

LATERAL SPREADING EFFECTS ON PILE FOUNDATIONS
DUE TO SOIL LIQUEFACTION

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TRB Annual Meeting, January 14, 1997

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**SOME EARTHQUAKES
WHERE DEEP FOUNDATIONS
HAVE BEEN DAMAGED BY LATERAL SPREADING**

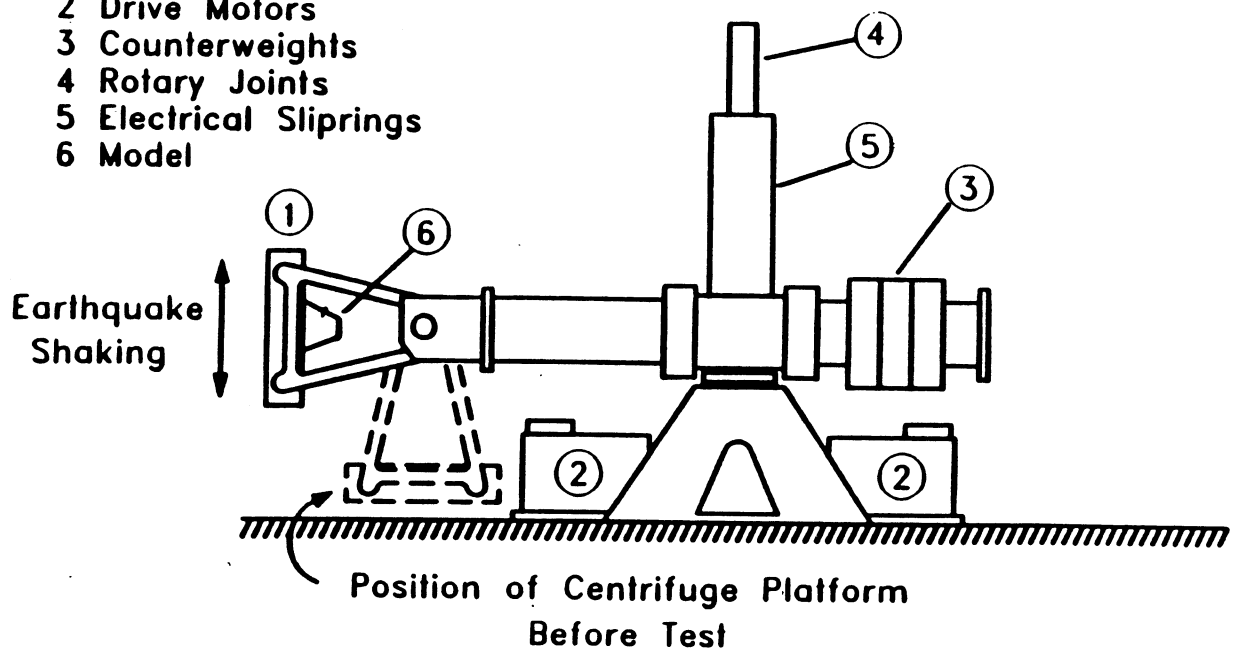
YEAR	EARTHQUAKE	COUNTRY
1906	San Francisco	USA
1964	Niigata	Japan
1964	Alaska	USA
1976	Tangshan	China
1983	Nihonkai-Chubu	Japan
1985	Chile	Chile
1989	Loma Prieta	USA
1990	Luzon	Philippines
1991	Limon	Costa Rica
1993	Hokkaido-Nansei-Ok	Japan
1995	Hyoken-Nambu (Kobe)	Japan
1995	Manzanillo	Mexico

CONCLUSIONS

- Liquefaction-induced lateral spreading is important cause of damage to pile foundations
- Main damage locations:
 - pile top
 - boundaries between liquefied and nonliquefied soil layers
- Permanent horizontal surface ground displacement in free field near pile is main parameter determining damaging bending moments
- Other important parameters are:
 - pile bending stiffness and strength
 - pile cap/connections stiffness and strength
 - nonliquefied layers stiffness and strength
 - depth, thickness of liquefied layer
 - properties of liquefied soil (in some cases)
- Centrifuge model test results can be used to:
 - evaluate specific case histories or design situations
 - calibrate computer programs (B-STRUCT)

LEGEND

- 1 Platform (during test)
- 2 Drive Motors
- 3 Counterweights
- 4 Rotary Joints
- 5 Electrical Sliprings
- 6 Model



RPI Geotechnical Centrifuge